Chapter 3

Statewide Trends and Forecasts -- Criteria Pollutants

Introduction
Emission Trends and Forecasts

The most current emissions data available are from 2003. Any data prior to this year are derived from historical emissions data. Future year data are forecasted from the 2003 base year and control measures reported through September 2003. Forecasts take into account emissions data, projected growth rates, and future control measures to calculate emissions in future years.

On a statewide basis, emissions of NO_x increased between 1975 and 1985, but are declining between 1985 and 2010. Emissions of ROG decreased steadily between 1975 and 2010. In addition to being ozone precursors, both NO_x and ROG are secondary contributors to PM_{10} and $PM_{2.5}$. Direct PM_{10} emissions show a slight increase from 1975 to 1990, a slight decrease in 1995 and 2000, and then a slow increase after 2000. Direct $PM_{2.5}$ emissions decreased from 1975 to 1985, increased from 1985 to 1990, decreased slightly betwwen 1990 and 1995, and have increased from 1995 to 2010.

Emissions of CO have decreased since 1985. The recent decrease in NO_x, ROG, and CO is occurring even with increases of VMT and population levels.

Statewide Emissions (tons/day, annual average)								
	1975	1980	1985	1990	1995	2000	2005	2010
NOx	4815	4986	4949	4850	4142	3663	3040	2519
ROG	7046	6612	6043	4606	3599	2978	2403	2146
PM10	1899	1927	2001	2132	2039	2042	2101	2164
PM2.5	802	782	775	810	755	753	772	788
CO	41292	37605	35584	29599	22210	16887	13197	10835

Table 3-1

Statewide Population and VMT

Airborne pollutants result in large part from human activities, and growth generally has a negative impact on air quality. California is fortunate in that it boasts the world's most progressive emission controls. These controls have resulted in significant air quality improvements, despite substantial growth.

During 1983 through 2002, statewide maximum 1-hour ozone values decreased 57 percent, and maximum 8-hour carbon monoxide values dropped 45 percent. These air quality improvements occurred at the same time the State's population increased 39 percent and the average daily number of vehicle miles traveled (VMT) increased 86 percent. Ambient annual average PM_{10} values in the non-desert areas also show improvement: a 36 percent decrease from 1989 to 2002. While the air quality improvements are impressive, additional emission controls will be needed to offset future growth.

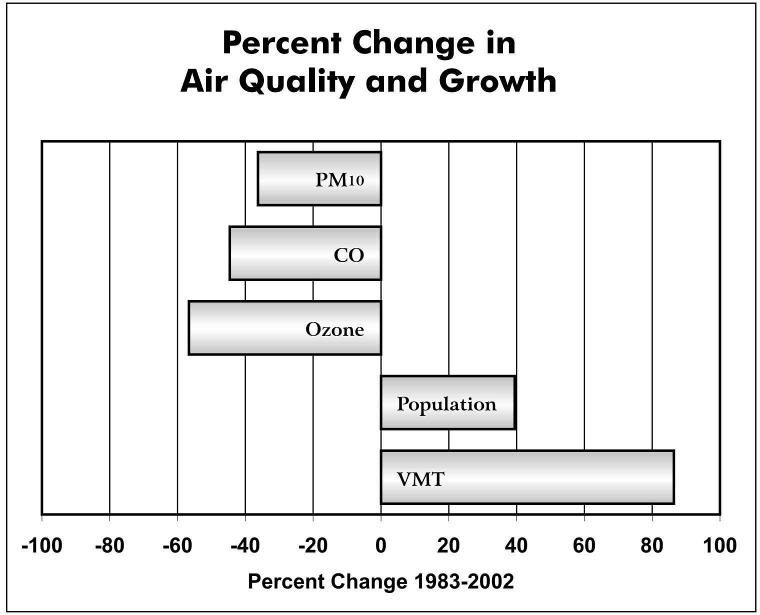

Figure 3-1

Ozone

Emission Trends and Forecasts - Ozone Precursors

NO_x Emission Trends and Forecasts

NO_x emission standards for on-road motor vehicles were introduced in 1971 and followed in later years by the implementation of more stringent standards and the introduction of three-way catalysts. NO_x emissions from on-road motor vehicles have declined by over 28 percent from 1990 to 2000, and NO_x emissions are projected to decrease by an additional 41 percent between 2000 and 2010. This has occurred as vehicles meeting more stringent emission standards enter the fleet, and all vehicles use cleaner burning gasoline and diesel fuel or alternative fuels. Stationary source NO_x emissions dropped by 43 percent between 1980 and 1995. This decrease has been largely due to a switch from fuel oil to natural gas and the implementation of combustion controls such as low-NO_x burners for boilers and catalytic converters for both external and internal combustion stationary sources. State Implementation Plan (SIP) and conformity inventory forecasts may differ from the forecasts presented in this almanac. For additional information on these forecasts, please refer to the ARB SIP web page at *www.arb.ca.gov/planning/sip/sip.htm*.

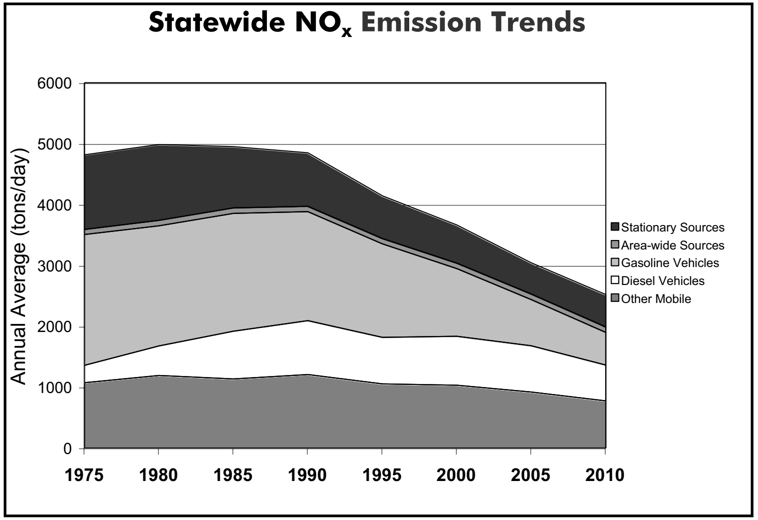

Figure 3-2

ROG Emission Trends and Forecasts

ROG emissions in California are projected to decrease by over 69 percent between 1975 and 2010, largely as a result of the State's on-road motor vehicle emission control program. This includes the use of improved evaporative emission control systems, computerized fuel injection, engine management systems to meet increasingly stringent California emission standards, cleaner gasoline, and the Smog Check program. ROG emissions from other mobile sources are projected to decline between 1990 and 2010 as more stringent emission standards are adopted and implemented. Emissions from other mobile sources are significantly higher than previous editions of the almanac due to methodology improvements for small off-road engines. Substantial reductions have also been obtained for area-wide sources through the vapor recovery program for service stations, bulk plants, and other fuel distribution operations. There are also on-going programs to reduce overall solvent ROG emissions from coatings, consumer products, cleaning and degreasing solvents, and other substances used within California. Again, State Implementation Plan (SIP) and conformity inventory forecasts may differ from the forecasts presented in this almanac. For additional information on these forecasts, please refer to the ARB SIP web page at *www.arb.ca.gov/planning/sip/sip.htm*.

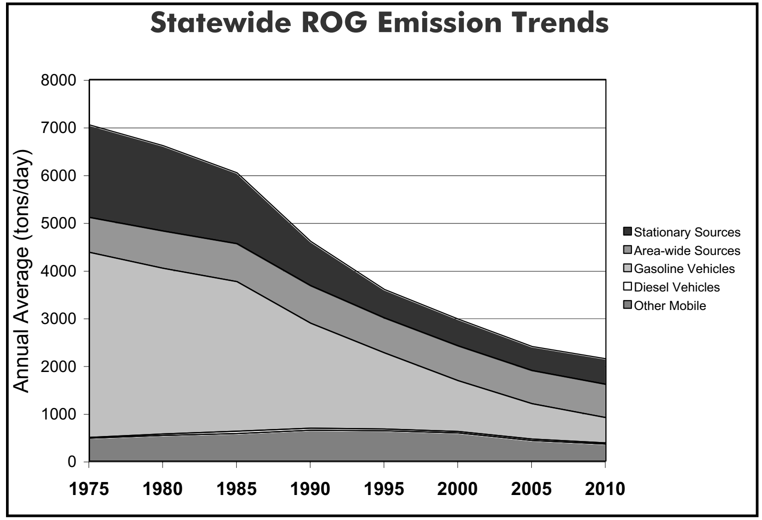

Figure 3-3

Emission Trends and Forecasts - Ozone Precursors

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**4815**	**4986**	**4949**	**4850**	**4142**	**3663**	**3040**	**2519**
Stationary Sources	1226	1247	1004	881	703	627	511	531
Area-wide Sources	83	88	91	87	87	90	93	89
On-Road Mobile	2435	2459	2721	2675	2301	1915	1518	1127
Gasoline Vehicles	2149	1975	1936	1789	1535	1113	757	536
Diesel Vehicles	286	484	784	885	766	802	761	590
Other Mobile	1072	1192	1133	1207	1052	1031	918	772

Table 3-2

ROG Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**7046**	**6612**	**6043**	**4606**	**3599**	**2978**	**2403**	**2146**
Stationary Sources	1935	1789	1484	927	597	560	502	535
Area-wide Sources	735	780	797	790	733	733	698	700
On-Road Mobile	3896	3506	3186	2243	1634	1096	772	557
Gasoline Vehicles	3880	3475	3138	2198	1597	1064	741	530
Diesel Vehicles	17	31	48	45	36	32	31	27
Other Mobile	480	537	577	646	635	589	430	354

Statewide Air Quality - Ozone

Air quality as it relates to ozone has improved greatly in all areas of California over the last 20 years, despite significant growth. The statewide trend, which reflects values for the South Coast Air Basin, shows that the maximum peak 1-hour indicator declined 51 percent from 1983 to 2003. During 1983 to 2002, the statewide population grew by 39 percent and the number of vehicle miles traveled each day was up more than 86 percent. Motor vehicles are the largest source category of ozone precursor emissions, and reducing their emissions will continue to be the cornerstone of California's ozone control efforts. New vehicles must meet the ARB's low emission vehicle standards, which equate to about 95 percent fewer smog-forming emissions than vehicles produced in the 1970s. However, increases in population and driving are partially offsetting the benefits of cleaner vehicles. In addition to motor vehicle controls, the ARB is establishing controls for other sources of ozone precursor emissions, such as consumer products. The ARB and other agencies are also looking at new and more efficient ways of doing business and implementing incentive programs to improve air quality.

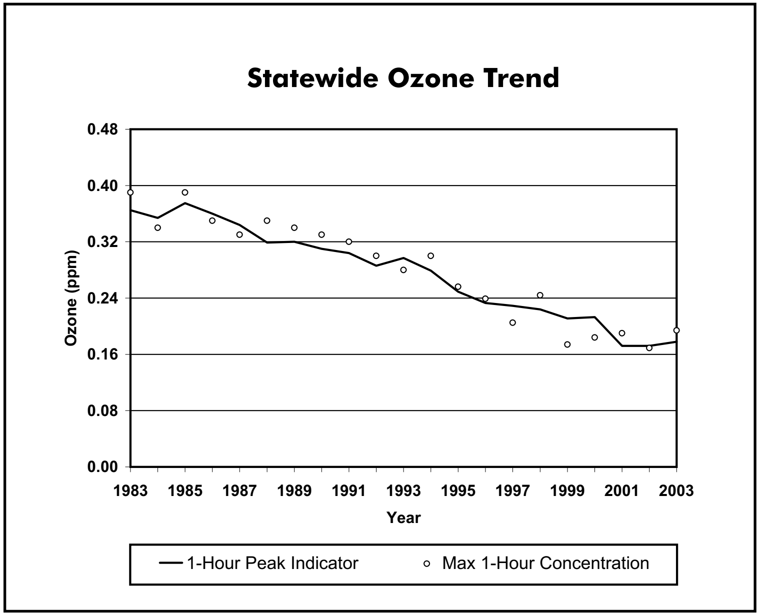

Figure 3-4

Population-Weighted Exposures Over the State Ozone Standard

There are a number of ways to look at how ozone levels have changed over the years. Though simple indicators are most commonly used, complex indicators can offer additional insight concerning air quality. One such indicator is the *population-weighted exposure* indicator. As used here, an "exposure" occurs when a person experiences a one-hour ozone concentration outdoors that is higher than 0.09 ppm, the level of the State standard. The population-weighted exposure indicator considers both the level and the duration of ozone concentrations above the State standard. The annual exposure is the sum of all the hourly exposures during the year and presents the result as an average per exposed person.

In contrast to the peak indicator, which provides an indication of the potential for acute adverse health impacts, the population-weighted exposure provides an indication of the potential for chronic adverse health impacts. For the purposes of computing the exposures in this almanac, individuals are presumed to have been exposed to concentrations measured by the ambient (outdoor) air quality monitoring network. However, daily activity patterns (for example, being inside a building or exercising outdoors) may diminish or increase exposures to some outdoor concentrations that exceed the State standard. While many indicators characterize air quality at an individual monitoring location, the exposure indicator provides an integrated regional perspective. For each hour, the calculations simultaneously consider ozone data from all of the monitors in a region. People living in areas where ozone exceeds the standard are then included in the population-weighted exposure for that hour.

The examples below show two simple exposure calculations. First, a measured ozone concentration of 0.11 ppm for one hour represents an exposure of 0.02 ppm-hours above the State ozone standard of 0.09 ppm:

$$(0.11 \text{ ppm} - 0.09 \text{ ppm}) \times 1 \text{ hour} = 0.02 \text{ ppm-hours}$$

Second, a measured concentration of 0.10 ppm for two hours also equals an exposure of 0.02 ppm-hours:

$$(0.10 \text{ ppm} - 0.09 \text{ ppm}) \times 2 \text{ hours} = 0.02 \text{ ppm-hours}$$

In contrast to these examples, when the concentration is equal to or below the level of the State standard of 0.09 ppm, the exposure is zero. The population associated with these "zero" exposures are not included in the exposure calculations in this almanac because including population with the zero exposures dilutes the real impact of the ozone concentrations that are above the State standard and are, therefore, adversely affecting public health. In all cases, an exposure calculation that excludes the zero values will be higher than one incorporating concentrations at or below the level of the standard (areas of zero exposure).

The population-weighted exposures in Table 3-3 are listed for each year, from 1982 through 2002, for the five most populated areas of California: the South Coast Air Basin, the San Francisco Bay Area Air Basin, the San Joaquin Valley Air Basin, the San Diego Air Basin, and the Sacramento Metropolitan Area (the southern, urbanized portion of the Sacramento Valley Air Basin and a portion of the Mountain Counties Air Basin). While these areas do not encompass all of California's ozone nonattainment areas, they do include the major urban areas where the majority of the State's population lives.

The exposure values listed in Table 3-3 are presented in parts per million to be consistent with the units in which the State standard is expressed. In addition to the exposure values, Table 3-3 also lists the percent of the total population represented in the exposure value. The percent value reflects the percent of the total population in the area that was exposed to an ozone concentration above the level of the State standard for at least one hour during the year. Because the exposure result is an average, it may not accurately portray the exposure of any particular individual or subarea. Some people in the region experience higher exposure while others experience lower exposure. Nevertheless, this method provides a reasonable approach for comparing exposures among various regions and for assessing trends in exposure reductions.

The calculations for the exposure indicators are based on all concentrations measured in the area that satisfy the specified data requirements. The population is based on census tract data, and the calculation is performed at the census tract level and then aggregated to the regional level. Exposures for the years 1982 through 1999 use census information for 1990, while exposures for the years 2000, 2001, and 2002 use census information for the year 2000. General details about the computational procedure can be found in the ARB publication entitled: *"Guidance for Using Air Quality-Related Indicators in Reporting Progress in Attaining the State Ambient Air Quality Standards"* (September 1993).

Ozone Exposures Over the State Standard: Population-Weighted (ppm-hours / person)																					
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
South Coast Air Basin																					
Exposure	32.85	41.61	36.58	36.90	35.68	31.41	34.28	29.58	22.10	22.21	21.99	17.96	18.90	13.26	10.67	6.28	8.88	3.27	5.31	6.90	7.09
% Pop. Represented*	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	97%	100%	92%	98%	99%	100%	88%	78%
San Francisco Bay Area Air Basin																					
Exposure	0.81	2.28	2.28	1.45	0.85	1.81	1.24	0.67	0.46	0.48	0.54	0.41	0.26	1.06	1.03	0.10	0.95	0.62	0.33	0.34	0.35
% Pop. Represented	57%	97%	100%	73%	46%	72%	73%	53%	41%	45%	50%	72%	39%	81%	60%	48%	54%	65%	25%	48%	29%
San Joaquin Valley Air Basin																					
Exposure	7.85	5.61	7.25	8.09	10.00	10.09	9.38	7.12	5.21	6.09	5.64	6.18	6.43	6.10	6.96	3.73	6.60	4.47	4.59	4.70	5.81
% Pop. Represented	98%	97%	97%	97%	95%	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%	99%
San Diego Air Basin																					
Exposure	7.15	9.60	6.94	8.17	5.16	5.64	7.40	7.29	6.35	3.92	3.31	2.74	2.28	2.41	1.19	0.83	1.92	0.60	0.52	0.70	0.38
% Pop. Represented	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	79%	100%	98%	100%	83%	70%	72%	95%	75%
Sacramento Metropolitan Area																					
Exposure	2.29	2.32	3.11	2.88	2.57	3.19	4.22	1.83	2.14	2.47	2.35	1.10	1.76	2.20	1.85	0.51	1.97	1.44	1.14	1.07	1.51
% Pop. Represented	100%	94%	100%	93%	94%	100%	100%	100%	100%	99%	100%	100%	95%	100%	100%	98%	100%	100%	99%	100%	99%

* *% Population Represented* is the percent of the total population residing in an area exposed to an ozone concentration above the level of the State standard for at least one hour during the year.

Some results changed for the time period 1998 to 2001 as compared with those in the 2003 Almanac. This is due to the correction of a calculation error.

Table 3-3

Ozone Transport

Since 1989, the ARB staff has evaluated the impacts of the transport of ozone and ozone precursor emissions from upwind areas to the ozone concentrations in downwind areas. These analyses demonstrate that the air basin boundaries are not true boundaries of air masses. All urban areas are upwind contributors to their downwind neighbors with the exception of San Diego. Figure 3-5 shows the upwind areas that impact downwind areas throughout the State. The ozone problem in some rural areas is caused almost solely by transported pollutants. These areas, although designated as nonattainment, are not required to adopt an air quality plan because local control strategies in these areas would not be effective in reducing ozone concentrations. However, these areas are subject to many statewide control strategies, such as cleaner fuels and low emission vehicles. More detailed information about ozone transport is available on the web at *www.arb.ca.gov/aqd/transport/transport.htm*.

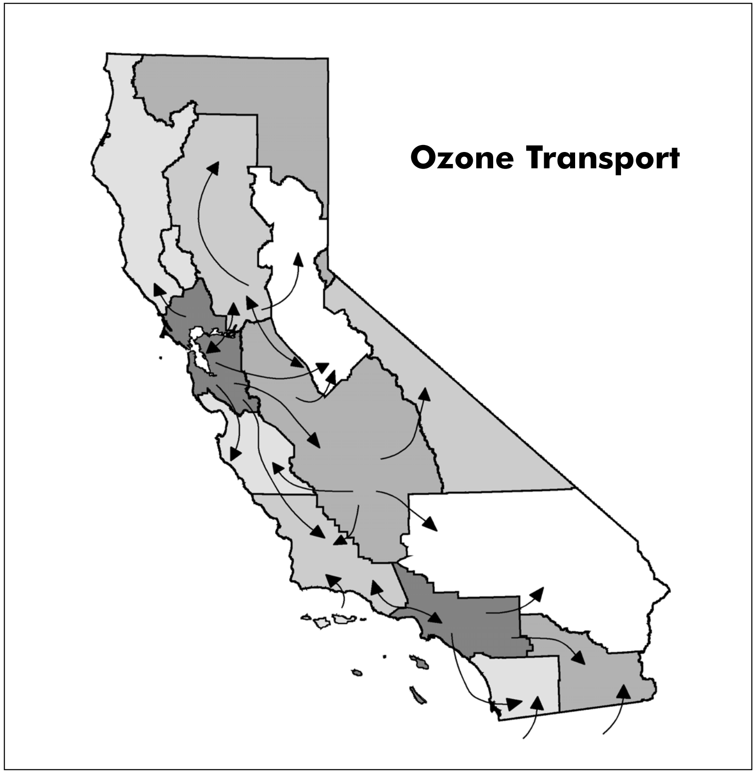

Figure 3-5

Directly Emitted Particulate Matter (PM_{10})
Emission Trends and Forecasts - Directly Emitted PM_{10}

PM_{10} emissions increase from 1975 to 1990, then decrease slightly in 1995 and 2000, and slowly increase after 2000. PM_{10} emissions are dominated by area-wide sources. Emissions from paved road dust more than double between 1975 and 2000. Unpaved road dust emissions increase slightly, while other area-wide sources decrease slightly. The increase in emissions of unpaved and paved road dust are due to increases in vehicle miles traveled (VMT) over these roads. Exhaust emissions from diesel vehicles dropped by 52 percent from 1990 to 2000 due to more stringent emissions standards and the introduction of cleaner burning diesel fuel. PM_{10} emissions from stationary sources are expected to increase slightly in the future due to industrial growth.

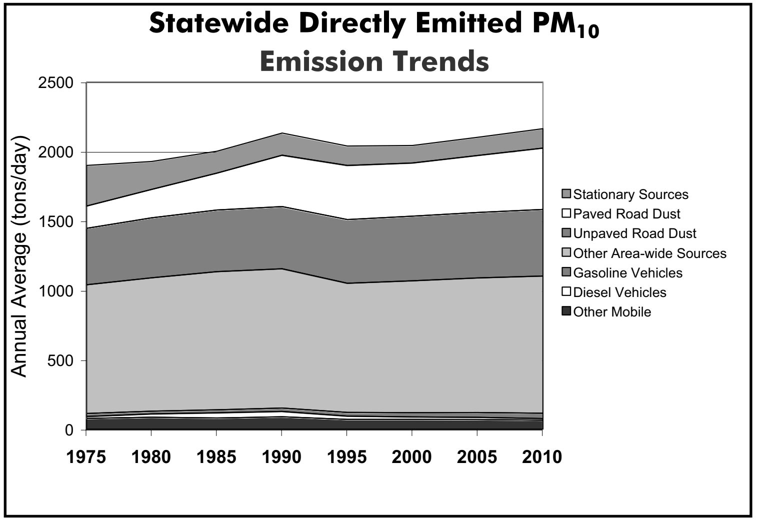

Figure 3-6

Emission Trends and Forecasts - Directly Emitted PM_{10}

Directly Emitted PM_{10} Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**1899**	**1927**	**2001**	**2132**	**2039**	**2042**	**2101**	**2164**
Stationary Sources	293	201	157	159	140	125	130	140
Area-wide Sources	1493	1597	1704	1819	1778	1798	1851	1908
Paved Road Dust	160	204	266	370	390	383	411	441
Unpaved Road Dust	407	432	444	447	458	465	471	480
Other Area-wide Sources	926	961	994	1002	930	950	969	987
On-Road Mobile	36	43	60	63	51	49	50	51
Gasoline Vehicles	22	19	21	25	27	30	34	39
Diesel Vehicles	14	24	38	38	24	18	16	12
Other Mobile	78	86	80	90	71	71	70	65

Table 3-4

Directly Emitted Particulate Matter ($PM_{2.5}$)

Emission Trends and Forecasts - Directly Emitted $PM_{2.5}$

$PM_{2.5}$ emissions decrease from 1975 to 1985 as a result of reduced stationary source emissions. Emissions increase slightly between 1995 and 2010. $PM_{2.5}$ emissions are dominated by area-wide sources. Emissions from paved road dust more than double between 1975 and 2000. Unpaved road dust emissions increase slightly, while other area-wide sources decrease slightly. The increase in emissions of unpaved and paved road dust are due to increases in vehicle miles traveled (VMT) over these roads. Exhaust emissions from diesel vehicles dropped by 52 percent from 1990 to 2000 due to more stringent emissions standards and the introduction of cleaner burning diesel fuel. $PM_{2.5}$ emissions from stationary sources are expected to increase slightly in the future due to industrial growth.

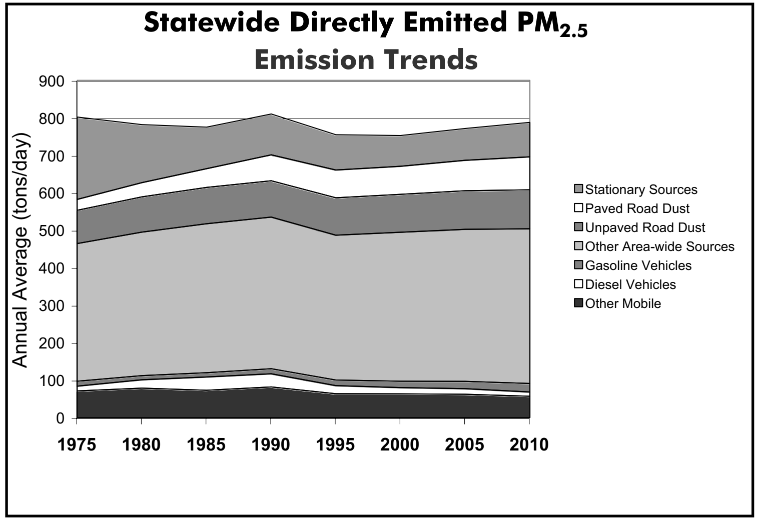

Figure 3-7

Emission Trends and Forecasts - Directly Emitted $PM_{2.5}$

Directly Emitted $PM_{2.5}$ Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**802**	**782**	**775**	**810**	**755**	**753**	**772**	**788**
Stationary Sources	220	155	111	109	94	82	85	92
Area-wide Sources	485	515	544	571	560	573	590	605
Paved Road Dust	29	38	50	69	74	75	81	88
Unpaved Road Dust	89	94	97	97	100	101	103	104
Other Area-wide Sources	367	383	397	405	386	397	406	413
On-Road Mobile	26	33	47	48	37	34	34	34
Gasoline Vehicles	13	11	12	13	15	17	20	23
Diesel Vehicles	12	22	35	35	22	17	15	11
Other Mobile	72	79	73	82	64	63	63	57

Table 3-5

Statewide Air Quality - PM_{10}

In contrast to ozone and carbon monoxide, PM_{10} concentrations do not relate as well to growth in population or vehicle usage, and high PM_{10} concentrations do not always occur in high population areas. Activities that contribute directly to high PM_{10} include wood burning, agricultural activities, and driving on unpaved roads. In addition, emissions from stationary sources and motor vehicles form secondary particles that contribute to PM_{10} in many areas. Figure 3-8 shows the maximum statewide annual average of quarters PM_{10} concentrations for a non-desert area. The trend line reflects, for the most part, the South Coast Air Basin. The low value for the maximum annual average of quarters in 1988 is due to the limited number of monitors with complete data for this year during the startup of the PM_{10} monitoring network. The period between 1989 and 2002 provides a better indication of trends. Over this period, the maximum annual average of quarters shows a decrease of about 36 percent. However, there is a great deal of variability, especially during the latter years. Much of this variability may be due to meteorology rather than changes in emissions. Several more years of data are needed before making any judgement about the direction of the trend. Currently, over 99 percent of Californians breathe air that violates the State PM_{10} standards during at least part of the year. As a result, PM is commanding greater attention, and much effort will be needed to attain the standards for this pollutant.

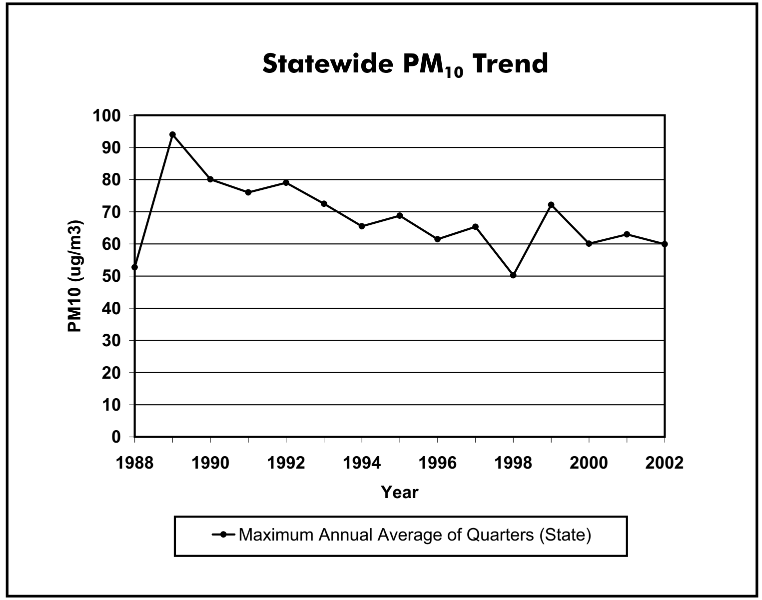

Figure 3-8

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Carbon Monoxide (CO)

Emission Trends and Forecasts - Carbon Monoxide

Since 1975, even though motor vehicle miles traveled (VMT) have continued to climb, the adoption of more stringent motor vehicle emissions standards has dropped statewide CO emissions from on-road motor vehicles by over 68 percent in 2000. With continued vehicle fleet turnover to cleaner vehicles, including super ultra low emitting vehicles (SULEVs) and zero emission vehicles (ZEVs), and the incorporation of cleaner burning fuels, CO emissions are forecast to continue decreasing through the year 2010. CO emissions from other mobile sources are also projected to decrease through 2010 as more stringent emissions standards are implemented. Emissions from other mobile sources are significantly higher than previous editions of the almanac due to methodology improvements for small off-road engines. CO emissions from area-wide sources are expected to increase slightly due to increased waste burning and additional residential fuel combustion resulting from population increases.

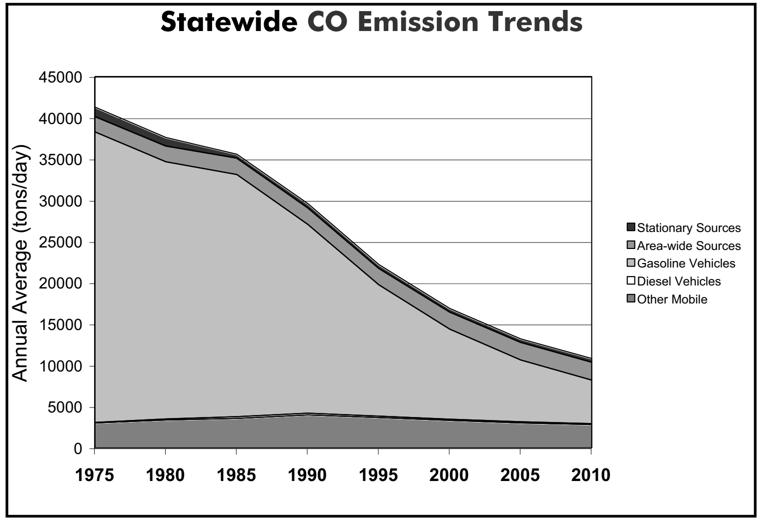

Figure 3-9

Emission Trends and Forecasts - Carbon Monoxide

CO Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**41292**	**37605**	**35584**	**29599**	**22210**	**16887**	**13197**	**10835**
Stationary Sources	1135	1010	453	495	443	414	402	436
Area-wide Sources	1871	1923	1995	2015	2009	2089	2145	2180
On-Road Mobile	35269	31295	29565	23087	16090	11059	7629	5397
Gasoline Vehicles	35199	31171	29359	22878	15915	10909	7487	5272
Diesel Vehicles	69	124	205	209	174	150	143	125
Other Mobile	3017	3378	3571	4002	3668	3325	3021	2821

Table 3-6

Statewide Air Quality - Carbon Monoxide

Similar to ozone, carbon monoxide concentrations in all areas of California have decreased substantially over the last 20 years, despite significant growth. Statewide, the maximum peak 8-hour indicator declined about 39 percent from 1983 to 2002. During 2002, measured carbon monoxide concentrations exceeded the level of the State and national standards only in Los Angeles County and the city of Calexico, in Imperial County. More years of data are needed to see if this trend will continue. The introduction of cleaner fuels has helped bring the rest of the State into attainment. While cleaner fuels will have a continuing impact on carbon monoxide levels, additional emission reductions will be needed in the future to keep pace with increases in population and vehicle usage. These reductions will come from continued fleet turnover, expanded use of low emission vehicles, and measures to promote less polluting modes of transportation.

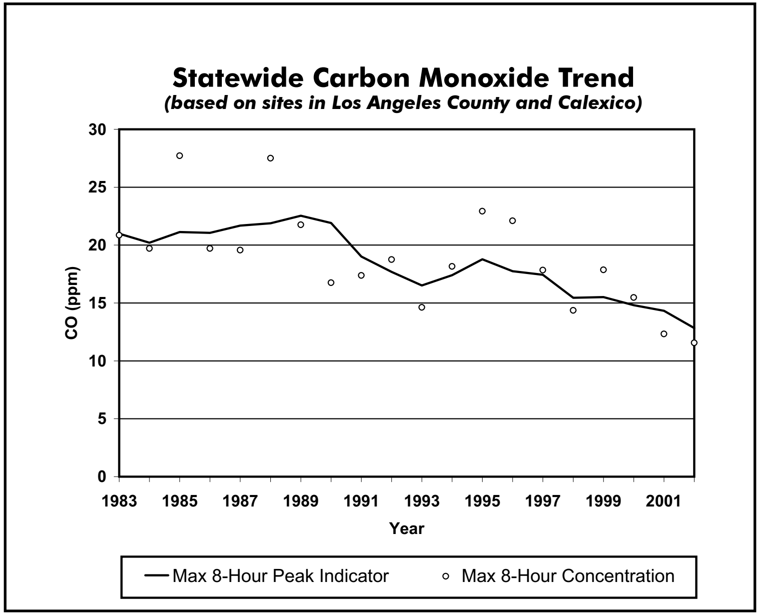

Figure 3-10

Success Stories

Statewide Air Quality - Lead

The decrease in lead emissions and ambient lead concentrations over the past 20 years is California's most dramatic success story. The rapid decrease in lead concentrations can be attributed primarily to phasing out the lead in gasoline. This phase-out began during the 1970s, and subsequent ARB regulations have virtually eliminated all lead from the gasoline now sold in California. All areas of the State are currently designated as attainment for the State lead standard (the United States Environmental Protection Agency does not designate areas for the national lead standard). Although the ambient lead standards are no longer violated, lead emissions from stationary sources still pose "hot spot" problems in some areas. As a result, the ARB identified lead as a toxic air contaminant in 1997.

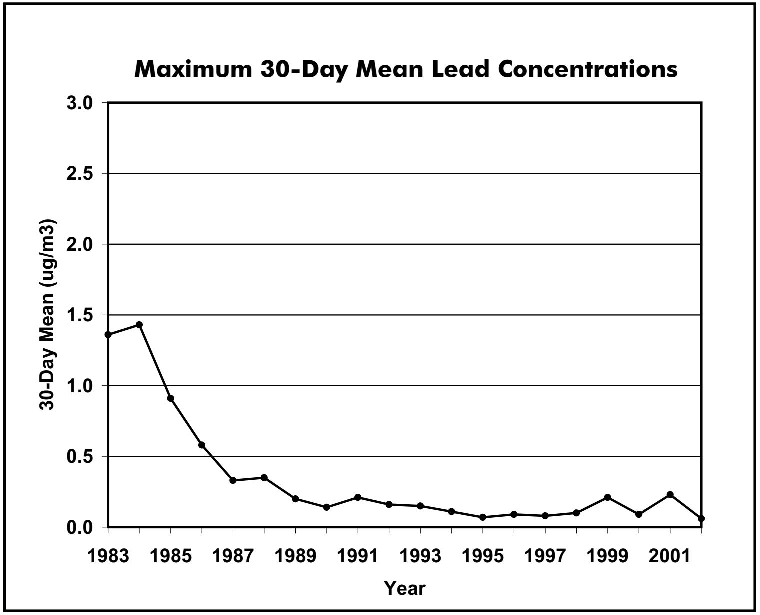

Figure 3-11

Nitrogen Dioxide

Emission Trends and Forecasts - Oxides of Nitrogen

Nitrogen dioxide (NO_2) is a colorless, tasteless gas that can cause lung damage, chronic lung disease, and respiratory infections. Nitrogen dioxide is a component of NO_x, and its presence in the atmosphere can be correlated with emissions of NO_x. Statewide emissions of NO_x are projected to decrease by almost 50 percent from 1990 to 2010 as a result of more stringent emissions standards for stationary source combustion and motor vehicles, and cleaner burning fuels. The introduction of lower emitting vehicles will continue to further reduce NO_x emissions.

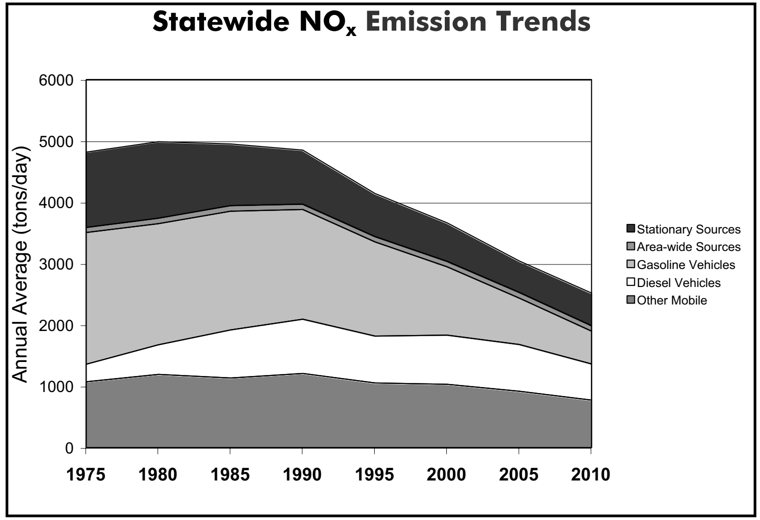

Figure 3-12

Emission Trends and Forecasts - Oxides of Nitrogen

NOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**4815**	**4986**	**4949**	**4850**	**4142**	**3663**	**3040**	**2519**
Stationary Sources	1226	1247	1004	881	703	627	511	531
Area-wide Sources	83	88	91	87	87	90	93	89
On-Road Mobile	2435	2459	2721	2675	2301	1915	1518	1127
Gasoline Vehicles	2149	1975	1936	1789	1535	1113	757	536
Diesel Vehicles	286	484	784	885	766	802	761	590
Other Mobile	1072	1192	1133	1207	1052	1031	918	772

Table 3-7

Statewide Air Quality - Nitrogen Dioxide

Oxides of nitrogen (NO_x) emissions are a by-product of combustion from both mobile and stationary sources, and they contribute to ambient nitrogen dioxide (NO_2) concentrations. Since 1983, maximum NO_2 concentrations have decreased 45 percent, due primarily to the implementation of tighter controls on both mobile and stationary sources. Although many of these controls were implemented to reduce ozone, they also benefited NO_2. All areas of California are currently designated as attainment for the State nitrogen dioxide standard and unclassified/attainment for the national nitrogen dioxide standard. Projections show NO_x emissions will continue to decline, thereby assuring continued attainment.

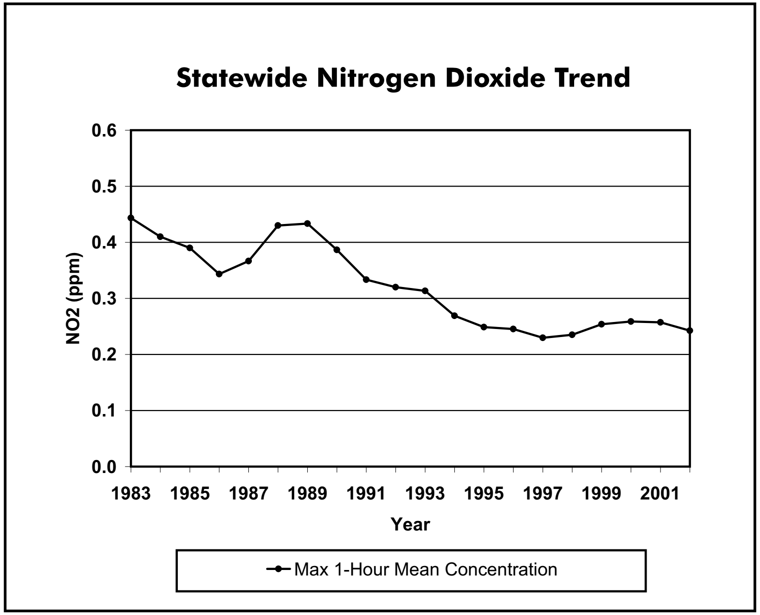

Figure 3-13

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Sulfur Dioxide

Emission Trends and Forecasts - Oxides of Sulfur

SO_x (oxides of sulfur) is a group of compounds of sulfur and oxygen. A major constituent of SO_x is sulfur dioxide (SO_2). Emissions of SO_x declined tremendously in California between 1975 and 2000. Emissions in 2000 are about 83 percent less than emissions in 1975. Sulfur dioxide emissions from stationary sources were decreased between 1975 and 2000 due to improved industrial source controls and switching from fuel oil to natural gas for electric generation and industrial boilers. The SO_x emissions from both gasoline and diesel vehicle exhaust have also decreased due to lower sulfur content in the fuel.

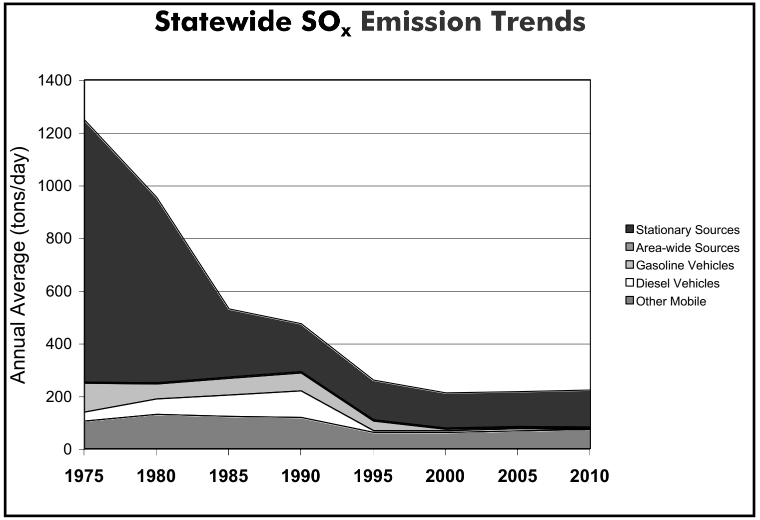

Figure 3-14

Emission Trends and Forecasts - Oxides of Sulfur

SOx Emission Trends (tons/day, annual average)								
Emission Source	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2010**
All Sources	**1248**	**954**	**530**	**474**	**260**	**212**	**216**	**222**
Stationary Sources	995	704	258	182	150	133	132	141
Area-wide Sources	4	5	5	5	5	5	5	4
On-Road Mobile	144	115	144	169	43	13	12	5
Gasoline Vehicles	110	57	64	68	36	6	4	4
Diesel Vehicles	34	59	81	101	7	7	8	1
Other Mobile	104	130	122	118	61	61	67	72

Table 3-8

Statewide Air Quality - Sulfur Dioxide

Similar to oxides of nitrogen, oxides of sulfur (SO_x) emissions come from both mobile and stationary sources. These SO_x emissions contribute to ambient sulfur dioxide (SO_2) concentrations. While SO_2 poses significant problems in other parts of the nation, SO_x emissions in California have been reduced sufficiently over the last 25 years so that all areas of California now attain the State standards for sulfur dioxide. Many of the major urban areas are also designated as attainment for the national sulfur dioxide standards. However, most of California is designated as unclassified. With current and anticipated SO_x emission control measures, all areas of the State are expected to remain attainment for SO_2.

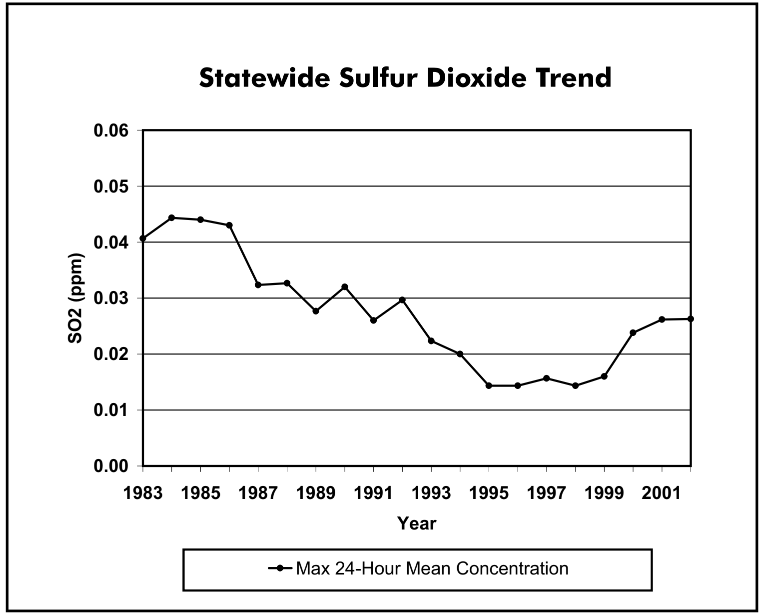

Figure 3-15